

Second Five-Year Review Report

for

Well 12A

**One of Three Operable Units
Commencement Bay, South Tacoma Channel
Superfund Site**

Tacoma, Washington

July 2003

Prepared by:

United States Environmental Protection Agency
Region 10
Seattle, Washington

Approved by:

Date:

/s/ Thomas Eaton

9/18/03

for
Michael F. Gearheard, Director
Office of Environmental Cleanup
U.S. EPA, Region 10

Executive Summary

The Well 12A, Operable Unit 1 (Well 12A or OU1) of the Commencement Bay, South Tacoma Channel, Superfund site, has been actively treating contaminated groundwater from the Time Oil property source area since 1988. The groundwater extraction and treatment system, GETS, was installed to provide a hydraulic protection barrier between the source area and the Tacoma municipal well 12A. In 1995, the GETS system was upgraded by adding four additional extraction wells to capture more of the contaminated groundwater. This system has been effective at controlling the source of the VOC contaminants from Time Oil property.

In an effort to remove VOC contaminants from the soil, surface soil cleanups were done to remove a contaminated filter cake material that was buried around the Time Oil source area. In addition to the surface soil removals, a soil vapor extraction (SVE) system was constructed to remove the VOCs from the soil. This system was effective and operated about 5 years until the residuals in the soil were no longer being effectively removed by the SVE system.

In 2001, a Remedial System Evaluation (RSE) was done by the US Army Corps of Engineers under contract to EPA. The focus of the RSE was an optimization of the pump and treat system, GETS. The RSE had some recommendations that would improve the GETS system and save money over time.

The first step in implementing the RSE recommendations is performing a Capture Zone Analysis. This study is in the planning stages and will be complete in 2004. The Capture Zone Analysis will identify possible changes in the extraction well network to make it more effective and determine if it is capturing and containing the contaminated groundwater plume.

Most of the other changes to the GETS system can be upgraded as a part of the operations and maintenance of the system. Pumps and wells will be needing replacement because of age and can be upgraded in a phased approach or all at once. The Washington Department of Ecology (Ecology) will have some major input into the system modifications as a result of the Capture Zone Analysis and system component upgrades. The O&M component of the Well 12A operable unit is planned to be transferred to Ecology in early 2004.

Since the ROD does not address Institutional Controls that would restrict the site for industrial use nor provide notification to future purchasers of lead and VOC contamination at the Time Oil property, development of Institutional Controls needs to be done. This should be done by the state as they will be taking over the long-term O&M and management of the site.

Five-Year Review Summary Form

Site Identification

Site Name: Commencement Bay, South Tacoma Channel (STC),
Operable Unit 1, Well 12A
EPA ID Number: WAD980726301
Region: 10
State: Washington
City/County: Tacoma, Pierce County

Site Status

NPL Status: Final
Remediation Status: Operating under LTRA
Number of OUs: Operational Unit #1 of 3 (see also: STC Tacoma
Landfill and STC South Tacoma Field)
Construction Completion Date: August 18, 1988

Review Status

Lead Agency: US EPA
Author Name: Neil E. Thompson
Author Title: Project Manager
Author Affiliation: EPA, Region 10
Review Period: January 2003 through July 2003
Date of Site Inspection: July 11, 2003
Type of Review: Post-SARA (pre-SARA for OU 1, post-SARA for site)
Five-Year Review Number: Second for OU1
Triggering Action: Previous Five-Year Review Report
Triggering Action Date (WasteLAN): July 16, 1998
Due Date: July 16, 2003

Issues

An EPA directed optimization study was done to evaluate the groundwater extraction and treatment system (GETS). The current system has been working since 1988 and significantly upgraded in 1995. The system is reaching its design life for

many of the components in the system. Although the system is protecting Tacoma's municipal well, 12A, from contamination, additional data is necessary to determine if the system is fully containing the contaminant plume. The data suggests that the groundwater contaminant source is a DNAPL about 80 feet below ground surface.

Since hazardous substances will remain onsite under the current ROD cleanup plans, the development of Institutional Controls needs to be added to protect future property users.

Recommendations and Follow-up Actions

The Remediation System Evaluation (RSE) optimization study recommended a "Capture Zone Analysis," be performed. This Capture Zone Analysis study is being planned for early 2004. This will help determine whether the current GETS system is containing and controlling the entire contaminated groundwater plume in addition to protecting well 12A.

The optimization study also recommended several upgrades to the GETS mechanical systems. Many of the upgrades are being implemented with ongoing maintenance of the operating system. The plan will be to complete the Capture Zone Analysis and then implement the changes that are recommended.

It is recommended that an Institutional Control component be added to any revisions to the ROD or cleanup plans. The current cleanup plans are for industrial uses of the property. Even though the site is zoned industrial/commercial it should have proper documentation to alert future property owners about soil and groundwater contamination.

This is a Fund Lead site which is planned for transfer to Ecology for operation and maintenance (O&M) activities. This would also be a proper time to add any property notices, i.e. deed notices, that Ecology would require.

Protectiveness Statement

The remedy at operable unit 1 (OU 1 or Well 12A) is considered protective in the short-term, because there is no evidence of exposure. In the interim while the GETS system is operating, exposure pathways that could result in unacceptable risks are being controlled. Additional capture analysis will verify if the GETS system fully contains the contaminant plume.

Based on the Five-Year Reviews for this site, the remedial actions at operable units 1 and 3 for this site (Well 12A, and South Tacoma Field) are considered protective. However, as stated in the Five-Year Review for OU2 dated May 14, 2003, the remedial action at OU2, Tacoma Landfill, cannot be determined to be protective until

further information is obtained, the protectiveness of entire site is deferred at this time. The remedial action at OU2 is not considered protective because certain issues and actions need to be taken to determine and ensure protectiveness. All of these actions are scheduled to be implemented by September 30, 2003.

Second Five-Year Review Report
Well 12A, OU #1
Commencement Bay, South Tacoma Channel
Tacoma, Washington

I. INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) which states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The US Environmental Protection Agency (EPA), Region 10 conducted the Five-Year Review of the remedy implemented at the Well 12A operable unit (OU1) of the South Tacoma Channel, Commencement Bay Superfund site, located in Tacoma, Washington. Conducting a Five-Year Review for this individual OU of the site is

consistent with the Region's approach to tracking the OUs as separate sites throughout the remedial process. This Second Five-Year Review for the Well 12A OU was conducted by the EPA Remedial Project Manager (RPM) from January 2003 through July 2003. The Five-Year Reviews have been completed for the Tacoma Landfill OU and the South Tacoma Field OU. This report documents the results of the review of the Well 12A OU.

This is the second five-year review for the Well 12A site. The triggering action for this statutory review is the completion of the First Five-Year Review Report, dated July 16, 1998. The five-year review is required because hazardous substances, pollutants, or contaminants remain in the soil and groundwater above levels that allow for unlimited use and unrestricted exposure.

II. SITE CHRONOLOGY

Table 1 Chronology of Site Events
Well 12A Site

<u>Event</u>	<u>Date</u>
Site Discovery	November 1, 1979
NPL Listing	September 8, 1983
ROD Signature (Well 12A Stripping Towers)	March 18, 1983
ROD Amendment (IRM)	May 3, 1985
Remedial Investigation/Feasibility Study completed	May 3, 1985
Unilateral Order for Settlement (PRP1)	June 3, 1985
Remedial Design Start - Groundwater	April 19, 1985
Remedial Design Complete - GW	April 23, 1987
Remedial Action Start - GW	June 11, 1987
Remedial Design Start - Soil	March 19, 1985
Consent Decree for Settlement (PRP1)	November 4, 1988
Remedial Design Complete - Soil	June 5, 1991
Remedial Action Start - Soil Vapor Extraction	July 19, 1990
Remedial Action Complete - SVE	November 1, 1997
Consent Decree for Settlement (PRP2)	January 31, 1995
First Five-Year Review	July 16, 1998
Remediation System Evaluation (RSE)	December 10, 2001

III. BACKGROUND

Site Location and Description:

The "Well 12A site" is an operable unit (OU1) of the Commencement Bay, South Tacoma Channel Superfund site located in Tacoma, Washington (Figures 1-1 and 1-2). The Well 12A site encompasses the City of Tacoma's production Well 12A, and the source of the contamination, property owned by the Time Oil Company. Well 12A is located on Pine Street between 38th Avenue and South Tacoma Way. The Time Oil property is located at 3811 South Tacoma Way. The area near Well 12A includes industrial, commercial, and residential areas and is approximately 6 miles south of Commencement Bay, adjacent to Interstate 5 and State Highway 16.

Well 12A is one of 13 wells in a well field which provides 40% of the summer drinking water for Tacoma.

Site History:

A) Discovery:

On four different occasions between July and September of 1981, chlorinated organic solvents were detected in Well 12A. As a result, the City of Tacoma Water Department voluntarily removed Well 12A from production during September of that year.

EPA did a site investigation between July and September, 1981. Consequently, the site was proposed for listing on the National Priority List (NPL) on September 1, 1981. On September 8, 1983, Well 12A was added to the NPL.

B) Phase I Remedial Investigation:

In April, 1982, EPA authorized a Remedial Investigation (RI) to determine the source, type, and extent of the contamination. The levels of the groundwater contaminants of concern at the site were determined to be:

1,1,2,2-tetrachloroethane	- 17 to 300 ppb
1,2-trans-dichloroethylene	- 30 to 100 ppb
trichloroethylene	- 54 to 130 ppb
tetrachloroethylene	- 1.6 to 5.4 ppb

The study also determined that the major source of contamination was generally

northeast of Well 12A.

During the RI, eleven monitoring wells were installed. By measuring groundwater elevation in the wells, it was determined that the natural, undisturbed groundwater flow direction was from west to east (and thus the contaminant flow was away from Well 12A) with a low velocity. However, with the well field in production, the flow direction reversed, and the plume was drawn towards the wells.

One conclusion of the RI was that Well 12A, if operated, would intercept the contamination drawn from the source area even if other production wells were pumping. In effect, Well 12A would provide a barrier to the spread of contamination and protect the rest of the well field. If Well 12A were not operated to provide a barrier, it was hypothesized that other operating wells would draw the contaminant plume and would be lost for drinking water use.

C) Phase I Focused Feasibility Study/Initial Remedial Measures:

In January, 1983, EPA authorized a Focused Feasibility Study (FFS) to determine the most cost effective treatment for Well 12A that would protect the drinking water supply for the City of Tacoma. The study included an endangerment assessment that evaluated risks to the general population if no action was taken.

The FFS concluded that pumping and treating the water from Well 12A by air stripping was the only feasible remedial alternative that could be implemented on an interim basis to control the spread of contamination and prevent the loss of the well field. The available treatment methods were determined to be air stripping and carbon adsorption, and each was evaluated in laboratory tests. Because carbon adsorption was found to be more expensive than air stripping for the observed contaminant levels, it was eliminated from further evaluation.

On March 18, 1983, EPA signed a Record of Decision (ROD) for an Initial Remedial Measure calling for the design and construction of five air stripping towers operating in parallel to treat up to 3,500 gpm of contaminated groundwater and discharging treated water to either Commencement Bay or to the City's water system depending on measured quality and the City's needs. The decision level used to determine whether the treated well water would be discharged to the City's municipal water system or the bay (via storm drains) was the 10^{-6} risk level determined at the tap (after dilution in the system).

The construction of this remedial action was authorized on March 24, 1983, and system startup occurred July 17, 1983. The system was operated by the City until early November of that year when the peak demand well field was no longer needed. Since that time, operation of the Well 12A treatment system by the City of Tacoma has continued on a seasonal basis (augmentation of summer demands) to protect the well

field. Operation will continue until remediation is completed.

D) Phase II RI/FS:

Because the phase I RI identified only a general source location and not a specific site, EPA authorized a study of historical solvent use and disposal practices in the suspect area in December, 1982. Records of past investigations by the Tacoma/Pierce County Health Department, Tacoma Water Division, and the State Department of Ecology were reviewed and interviews were conducted with owners of numerous businesses in the area. A follow-up study focused on the historical uses and disposal of 1,1,2,2-tetrachloroethane (TCA) in the vicinity of Well 12A. The focus on TCA was based on the fact that the RI determined this chemical to be the predominant contaminant at the site, and an uncommonly used solvent. Since few businesses nearby used TCA, these studies reduced both the number and location of potential sources of the contamination by process of elimination.

In mid-May 1983, EPA authorized a supplemental RI/FS to further define the extent of groundwater contamination and to attempt to locate the source. Four monitoring wells were installed. These, in addition to the previously installed monitoring wells, were sampled several times between July and November, 1993. One of the new wells located near the Time Oil, Fleetline, and Burlington Northern properties showed concentrations of trichloroethylene, 1,1,2,2-tetrachloroethane, and 1,2-trans-dichloroethylene in the low ppm range. This level was substantially higher than detected in other wells. It was consequently determined that these properties were at or near the contaminant source.

With the apparent source area narrowed down substantially, EPA obtained air and near surface soil samples along the Burlington Northern railroad spur adjacent to the Time Oil plant. Air sampling results showed very low levels of contaminants, but soil samples were very high in trichloroethylene and 1,1,2,2-tetrachloroethane, confirming that this was the source of the contamination. The soil underlying the railroad track was composed of a fine grained filter cake that had been used during oil reprocessing operations at the site. The filter cake was contaminated with high concentrations of lead (1 to 2%) as well as organics. Remedial alternatives were then developed to treat both the soil and groundwater at the source and a proposed plan was issued for public comment.

IV. Remedial Actions

A. Record of Decision:

The Record of Decision (ROD) for treatment of the source of contamination reaching Well 12A was signed on May 3, 1985, and consisted of the following major

elements:

- Continue to operate the Initial Remedial Measures (IRM) (treatment of Well 12A effluent) until such time that the source control and remedial measures render the IRM unnecessary.
- Extract and treat the groundwater at the source to remove volatile organics, followed by discharge of a major portion of the treated extraction well effluent into Commencement Bay via an existing storm sewer. The remaining treated extraction well effluent was to be recharged to the aquifer at the source area by means of a drain field in order to provide flushing of contaminants in the soil column.
- During the design phase, drill and sample up to 5 additional 30-foot soil test borings in order to better define the extent of soil contamination.
- Remove an appropriate length of railroad track adjacent to the Time Oil property and excavate the discolored, oily, fine-grained filter cake and soils under and adjacent to the railroad spur.
- Install drain field piping in the excavated areas and cover with a permeable material to protect the piping and prevent direct human contact with underlying soils.
- Pave or place a soil cover on the portions of the unpaved Time Oil parking lot not subject to excavation and flushing, in order to prevent direct human contact.
- Transport and dispose of all excavated, contaminated soils in a RCRA-permitted landfill.
- Maintain institutional controls prohibiting withdrawal of groundwater by private parties in portions of the aquifer where the level of hazard is in excess of 10^{-6} .
- Monitor groundwater to evaluate the performance of the treatment system.
- After two years of operation, evaluate the effectiveness of the groundwater extraction and treatment system in order to estimate the endpoint levels of treatment.

Essentially, the selected remedy for the site called for groundwater pump and treat using air stripping, excavation of contaminated soils and soil treatment by flushing to remove organics in subsurface soil.

The ROD allowed for changes in the remedy that were "equivalent in

effectiveness and cost or are necessary for the protection of health and the environment". During the remedial design that followed (see below) the remedy was modified in an April 28, 1987, memorandum to the Regional Administrator to consist of soil treatment by a Vapor Extraction System (VES) and groundwater treatment using carbon adsorption.

B. ROD Cleanup Goals:

The ROD provides four alternatives for groundwater cleanup. The cleanup goals are based on treating the groundwater at the source (the Time Oil property) to levels where concentrations are at the 10^{-6} risk level at Well 12A, or at the Time Oil property boundary. Final selection of one of the cleanup goal alternatives was to be based on operation data. The cleanup goals in the ROD (edited to be understandable out of context) are provided below in order of increasing length of treatment time and cost to reach the goal:

1. Treat groundwater at the source (the Time Oil site) so that contaminant levels reaching Well 12A would allow the effluent from Well 12A to be discharged untreated to the bay, or with treatment, allow the utilization of the Well 12A effluent for the City water supply after dilution with other waters. This alternative would lower the potential risk of high contaminant concentrations from the source reaching the well.
2. Treat the groundwater at the source in order to establish a level such that the untreated effluent from Well 12A could be used (after dilution with water from the rest of the well field) as drinking water.
3. Treat the groundwater at the source and establish a level such that the Well 12A effluent would be at the 10^{-6} risk level with no dilution.
4. Treat the groundwater to a level such that the groundwater at the source (within the property boundary) is at the 10^{-6} risk level.

The soil cleanup goals in the ROD are based on treatment until "the remaining contaminants pose no further threat to the groundwater". The determination of the appropriate levels was left to a later date.

Remedy Implementation:

A Remedial Design/Field Investigation report was completed in September, 1986. In September, 1987, construction began on the carbon adsorption groundwater extraction and treatment system (GETS) to treat contaminated groundwater at the contamination source. The system was completed in the Spring of 1988, was upgraded significantly in 1995, and is currently in operation. As part of this effort, a pilot VES

system was installed in 1993 on the Time Oil property, and the soil from the wells was sampled as they were drilled. The VES system was upgraded from its pilot status and operated until 1998.

V. Current Status:

The groundwater pump and treat system has been operating since 1988. The system was significantly upgraded in 1995 with the addition of four extraction wells. In 2002, almost 33 million gallons of contaminated water were extracted and treated removing approximately 464 pounds of VOCs before discharge to the storm sewer and Commencement Bay. Since 1988, over 550 million gallons of groundwater have been treated removing approximately 16,000 pounds of VOCs. The VES system that was started in 1993 was shut down in 1997 after removing approximately 54,100 pounds of VOCs and leaving soil contamination at concentrations that would not impact the groundwater. The VES system remains shut down.

A. Groundwater Cleanup

To date, there has been significant progress made in the remediation of the groundwater. Approximately 16,000 lbs of volatile organics have been removed by the GETS system. The remedial action is currently containing the plume and preventing it from migrating from the source area (Time Oil) towards Well 12A. Concentrations of organics in monitoring wells between the Time Oil property and Well 12A have decreased as shown by the following data from Well CBW10, a monitoring well between the Time Oil property and Well 12A (see Figure 4-6, Inset "A," for location of well):

Contaminant Concentration in Well CBW10

<u>Contaminant</u>	<u>MCL</u>	<u>April 1984¹</u>	<u>January 1987²</u>	<u>July 1992³</u>	<u>April 1998⁴</u>
1,1,2,2-TCA	None	848 µg/l	1500 µg/l	10 µg/l	14 ug/l
TCE	5 ug/l	488 µg/l	920 µg/l	49 µg/l	106 ug/l

¹ CH2M Hill, July 1984

² Ecology and Environment, March 1988

³ ICF, December 1992

⁴ ICF, December 1999

Figures 4-6 and 4-7 show comparisons of groundwater data from 1993 and 1998 for 1,1,2,2-tetrachloroethane (TCA or PCA in Figure 4-6) and 1,1,1-trichloroethylene

(TCE). These figures show the distribution of two contaminants in the groundwater around the Time Oil property. Both of these plumes show a decrease in size and concentration during a five year period of groundwater extraction by the GETS system. No general groundwater sampling except for the extraction wells and treated discharge has been performed since 1998.

B. Groundwater Extraction and Treatment System Expansion

The carbon adsorption groundwater extraction and treatment system (GETS) was designed for a total capacity of 500 gpm. The well capacity when the system began operating was approximately 200 gpm. In the subsequent years since operation, its capacity has been reduced to 100 gpm from siltation and iron bacteria buildup. In January, 1993, EPA began design of an extension of the system which added 4 additional extraction wells. Since 1995, the GETS has operated with five extraction wells. These wells get periodic treatment for iron bacteria buildup. The efficiency of the wells has decreased to the point where some decisions about redeveloping the wells have to be considered. Some answers to these types of O&M issues will be addressed by the Capture Zone Analysis study.

C. Soil Cleanup

A filter cake material containing lead and VOCs used in the reprocessing of petroleum products was found on the surface soil when the Time Oil property was initially investigated. Prior to the installation of the VES system in 1992 the surface soil was cleaned up. The filter cake material was removed from the west side of the property (west of the warehouse). Soil was removed until the concentration of lead remaining in the soil was less than 1000 ppm, the industrial cleanup standard. The site was then backfilled and paved which prevents health and environmental risk pathways.

VI. Progress Since Last Review

A. Protectiveness Statement from the [First] Five-Year Review

“There is currently no threat to human health posed by the site from the groundwater or surface soil. The water from Well 12A is treated prior to discharge and all residences in the area are on the public water supply. Private wells for groundwater use are not permitted by local governments. Also, the Time Oil property has been cleared of all contaminated surface soil.”

B. Status of the Recommendations and Follow-up Actions from [First] Five-Year Review

There were no specific recommendations in the [First] Five-Year Review

concerning the operation of either the VES or GETS systems. As long as the systems continued operating at the same rates, the remedial actions were considered protective.

At the time of the [First] Five-Year Review the GETS system for treating groundwater had been expanded to 5 extraction wells and was effectively removing contaminants from the groundwater. The contamination of municipal well 12A, from the Time Oil source area, had been effectively controlled so that contaminants from Time Oil were not detected in samples taken from Well 12A.

During the past five years, the GETS system has continued to operate and control the groundwater contaminant migration towards Well 12A. The treated discharge water is directed to the city's storm sewer system which discharges into the Thea Foss Waterway, a marine receiving water. No contamination that could be attributed to the Time Oil source area has been recorded by the City of Tacoma from Well 12A.

VII. Five-Year Review Process:

The Five Year Review was conducted according to procedures in OSWER Directive 9355.7-03B-P, Comprehensive Five-Year Review Guidance. Activities in this review consisted of:

- 1) Review of site-related documents and agreements,
- 2) Review of monitoring data,
- 3) Discussions with operation and maintenance contractor
- 4) Site visit and inspection,
- 5) Community relations activities, and,
- 6) Preparation of the Five-Year Review report.

Documents reviewed for this report include:

Record of Decision, EPA, May 3, 1985.

Five-Year Review [First], Commencement Bay - South Tacoma Channel, Well 12A, Superfund Site, Tacoma, Washington, EPA, July 16, 1998.

Groundwater Summary Report, South Tacoma Channel/Well 12A, Superfund Site, Tacoma, Washington, ICF Kaiser Engineers, Inc., December 1999,

System Evaluation (RSE), South Tacoma Channel/Well 12A, Tacoma, Washington, US Army Corps of Engineers, December 10, 2001.

Annual Status Report for Groundwater Extraction and Treatment System, January Through December 2002, South Tacoma Channel/Well 12A Site, Tacoma, Washington, URS Group, July 2003.

Monitoring Data Review

The GETS Permit Discharge Limits have not changed since the ROD was signed, see Table 4-1. The permit limits the amount of specific contaminants that can be discharged to the city's storm sewer. The discharge monitoring point is just after the final treatment unit before it enters the stormwater system at the GETS location. The treatment system normally meets the discharge limits unless there are some operational problems with the GETS. There have been several times in the past five years where breakthrough has occurred and the discharge has been in violation (minor exceedences) of the discharge limits. This can occur because it normally takes three days for the treated water samples to be analysed and data reported back. The GETS system inflow (5 extraction wells) and discharge is monitored every two weeks. Operational changes or short shut-downs (1-5 days) of the system has corrected the problem. Carbon change-out are made approximately every four months. The monitoring data for the GETS system is reported biweekly and in annual reports to EPA.

The annual totals of groundwater pumped and treated and the quantity of VOCs removed are provided on Figure 5-1.

A presentation of representative VOC contaminant concentrations at the 5 extraction wells is displayed in Figure D-8.

Collectively, the data indicates that the groundwater remains contaminated at a relatively constant level, and the treatment of the extracted groundwater is removing the contaminants. No VOCs are released to the air since the GETS treatment is by carbon absorption/adsorption in the water phase. The spent carbon is sent off-site for regeneration.

The last round of groundwater monitoring, other than the extraction wells, was in 1998. The groundwater had been monitored periodically since 1982 when the problem was discovered in Well 12A. Other than the wells impacted by the extraction system at the Time Oil source area, the groundwater monitoring results remained very stable. The water quality in the regional aquifer is quite consistent over the last 15 years based on monitoring from Tacoma's municipal wells.

Figure 4-6 and Figure 4-7 compare two contaminants of concern 1,1,2,2-tetrachloroethane (PCA or 1,1,2,2-TCA) and trichlorethylene (TCE) from 1993 and 1998 sampling events. In both cases the contaminant plume for these contaminants has decreased in size.

Another 3 rounds of groundwater sampling are planned for 2004. These samples will be used to provide current input to the Capture Zone Analysis and to confirm that the plume is still controlled by the GETS system.

Discussions with O&M contractor

EPA has hired a contractor to operate the GETS treatment system. The current contractor has been at the site since 1999. The EPA Project Manager and contractor discuss any operational issues as they arise. Most of the issues during the last five years have been maintaining and replacing equipment. Overall, the GETS system has been operating consistently where any changes in system output has been due to the gradual aging of the wells and equipment. Periodic extraction well treatments for iron producing bacteria has been necessary and replacement of various pumps has been required. The change out of the carbon in the filter is routinely performed as breakthrough occurs in the lead vessel. Operationally there is a lead and lag carbon vessel.

The contractor concurred with the RSE report that efficiencies of the O&M could be improved with some capital improvement to the system. Since there may be some operational and/or extraction well changes, it has been decided that any major changes in the O&M should wait until after the Capture Zone Analysis. The Capture Zone Analysis may suggest that changes be made to the extraction well network to enhance the contaminated plume capture. This would be a change from the initial goal of the GETS system from protection of Well 12A to contaminated groundwater hydraulic capture. This type of change could require a change in the ROD to reflect any changes in the goal and objectives of the groundwater extraction and treatment system.

Ecology receives copies of monitoring data and has commented on the planned Capture Zone Analysis. According to EPA regulations, the O&M activity should be transferred to Ecology.

Site Visit and Inspection:

A. Site Visit

EPA conducted a site visit on July 11, 2003, to physically inspect the site area including Well 12A, the groundwater extraction and treatment system (GETS) compound, and the Time Oil property where the inactive VES hardware is located. The purpose of this visit was to ensure that there were no direct hazards to human health or

the environment. A copy of the Five-Year Review Site Inspection Checklist is attached.

The area surrounding the Time Oil property has not changed since the project began. The local zoning is commercial and industrial with an active rail line serving the area. The warehouse on the Time Oil property has been utilized intermittently by various businesses renting space. There are currently no remedial activities that effect the use of this warehouse. There are no specific Institutional Control measures stated in the ROD. A summary of the inspection results follows:

Well 12A

The area with the stripping towers is fenced to protect the well head and the towers from vandalism. There are no hazardous materials at this location. This area is under the operation of the City of Tacoma's Water Department. The site was secure and the air stripping towers did not appear to be active on the day of the inspection, so it was assumed that the well was not pumping. There was no reason to access this facility during the site inspection since this is not the source area for contamination.

GETS Compound

The GETS compound is fenced to protect the system from vandalism. The system contains two 20,000 pound carbon vessels which adsorb chlorinated organics from the groundwater and the associated plumbing and pumps. Other than the carbon, the only waste that is generated is from system maintenance activities which generate a drum of waste occasionally. These contaminated materials from the compound get sent off-site to a carbon recycling facility or to a proper hazardous waste disposal. The compound also houses a office/storage trailer that is used for the operation and maintenance of the system. On the day of the inspection, extracted water was entering the treatment system, passed through the two carbon filters and the treated water discharged to the storm sewer. Both the inlet and outlet piping are inside the fenced compound. The compound was secure on inspection day.

General Condition of Extraction/Treatment System

The observed conditions of the site do not reveal the operating condition of the GETS system. The five extraction wells are all in below grade vaults. The electrical and plumbing systems that connect the extraction wells to the treatment system are all below grade. Extraction Well 1 and the treatment system have been operating since 1988. The additional four extraction wells, 2-5, have been operating since 1995. The design called for a 200 gpm system. Currently the production rate is about 100 gpm from the combined five extraction wells. The limiting factor since installation of the components has been well production. For some reason the wells do not produce as much pumpable water as designed. These lower flows have not impaired the ability of the system to contain/control the migration of contaminants from reaching Well 12A.

The RSE optimization study suggested that a operating cost savings could be achieved by replacing the extraction well pumps with smaller and/or variable speed pumps since they are oversized for the flows being produced. Also the age of the system has caused increased maintenance of the treatment system and pump controls. These kinds of increased maintenance and replacement costs are not unexpected as systems age. As a part of the Capture Zone Analysis that is planned, an evaluation of the pumping requirements of the extraction system will be made. Changes may be suggested that will require capital costs to implement.

Although the GETS system has been operating since 1988, it is still functioning as intended. The system never met the design specifications, but protection of Well 12A has occurred. The treatment of the extracted contaminated groundwater is able to meet the effluent discharge requirements of the city.

Time Oil Property (VES location)

The Time Oil property is fenced to protect the inactive VES equipment from vandalism. During installation of the VES, all filter cake material contaminated with lead concentrations greater than 1000 ppm was removed from the site. Therefore, there is no longer a direct contact threat from surface material at the site. The parking lot was then backfilled and paved. Filter cake was identified east of the warehouse on the property, but it was underneath a concrete pad that was part of the old processing area. This area contains some lead and petroleum source material. The area was considered capped, but the filter cake was not removed as it was west of the warehouse. There is no direct contact with any contaminated material on the surface of the site.

B. Community Relations:

Community interest in this site has been low. Area residents seem to be confident that the water they receive is safe, (Well 12A was taken out of service when contamination was discovered, and since the installation of the stripping towers, contamination going into the water supply system has not been detected). On Wednesday, April 30, 2003, a Public Notice was placed in the *Tacoma News Tribune* stating that EPA was doing this Five-Year Review and to solicit any comment. No comments were received by EPA as a result of the newspaper notice.

A major goal of EPA's community relations program has been to keep the Tacoma area informed of activities in the Commencement Bay, South Tacoma Channel study area. Fact sheets are periodically sent out covering each operable unit.

VIII. Technical Assessment:

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The review of documents and data, ARARs, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. The GETS system is providing protection to municipal well 12A which was the initial intent of the groundwater treatment system. The treatment system meets the conditions for discharge of the treated water into the city's storm sewer system. The cost of the GETS treatment is expensive costing between \$300,000 and \$400,000 per year. The Remedial System Evaluation (RSE) study done in 2001 suggested several opportunities for optimizing the system. These are being implemented in phases. The site is well protected by municipal ordinances to prevent new wells from being constructed in the area, and the area is sewerred. The site is completely fenced which protects to equipment. The active extraction wells are below grade for protection.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes. Significantly more information about the conditions at the Time Oil site are known now than at the time the ROD was signed. Contaminated source material (filter cake) was removed from the Time Oil property and the VES system removed VOCs from the soil. Groundwater extraction and treatment has been consistently removing VOCs from the contaminated groundwater. Groundwater monitoring was done to define the limits of contamination and the results indicate that a DNAPL source of VOCs exists at about 80 feet below grade. Some wells have a petroleum LNAPL layer floating on top of the groundwater aquifer. There was no indication that the DNAPL or LNAPL spread during the groundwater monitoring period (1988-1998), but will be reconfirmed by the Capture Zone Analysis. The RSE report confirmed that there may be a source of DNAPL based on the extraction well monitoring data which has shown fairly constant concentration in the extracted groundwater since 1988.

The goal stated in the ROD was to treat until the remaining contaminants pose no further threat to the groundwater. Within that goal was the specific set of goals to treat the contaminated groundwater for various levels of protection of Well 12A. The actual cleanup goals were to be determined at a later date. The goal to protect Well 12A appears to be working, but there is some question about the containment and treatment of the entire contaminated groundwater source. It is partially for this reason that the Capture Zone Analysis was recommended to verify this issue. For this reason the remedial actions are considered protective for the short-term, because there is no current exposure. If the GETS system is or can capture and contain the contaminant plume then the remedy can provide full hydraulic containment of the plume. This could be considered a change from the original ROD goals and could result in an containment type of remedy. Implementation and monitoring of changes recommended by the Capture Zone

Analysis are the first steps. Certainly a full containment of the contaminant plume would be more protective of the aquifer than only protecting Well 12A.

There are no changes in the physical conditions of the site that would affect the protectiveness of the remedy. The ROD does not contain specific cleanup concentrations for the contaminants found at the Well 12A site. However, none of the remedial action objectives (RAOs) proposed for the site have been attained by the remedial actions as called for in the ROD. Even with the non attainment of the RAOs, the exposure assumptions and RAOs in the ROD are still valid. This site is zoned industrial and the surface soil cleanup levels are consistent with industrial use. The lead containing filter material that was removed was cleaned up to 1000 ppm, the industrial standard for lead. There were no Institutional Controls stated in the ROD, but the current cleanup actions have been to reduce the soil contaminant levels to industrial use standards, not residential use. Residual VOC contamination in the groundwater will also require some type of Institutional Controls since the groundwater on the site currently exceeds groundwater cleanup goals and will for many years. Development of Institutional Controls for this site is an issue that should be addressed.

Maximum contaminant levels (MCLs) in groundwater for drinking water purposes are developed for two of the contaminants of concern at this site. The MCL for both tetrachloroethylene (PERC) and trichloroethylene (TCE) is 5.0 ug/l in groundwater. This is one of the cleanup goals that could be established for this site. There is no MCL established for 1,1,2,2-tetrachloroethane, the other primary contaminant of concern.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. The remedial actions appear protective for the short-term and while the GETS system is operating. However, the indication that there may be DNAPL at the site changes the need to review the effect that the remedial actions have on this type of source. It is clear that the goal of the ROD, to protect Well 12A, is being met while the pump and treat system is operating. Based on the groundwater monitoring data done through 1998, it appears that the GETS system is controlling much of the contaminant plume, but there are gaps in the data that will only be filled by a new Capture Zone Analysis process. Currently, the only groundwater use from this area of Tacoma is by the city's municipal well network. City monitoring of their wells, including Well 12A, indicate the water is acceptable for their use. The city's ordinances do not allow private domestic well installation within the city.

There are no Institutional Controls required by the ROD, but hazardous

substances remain onsite above residential levels. As a result, Institutional Controls should be required to keep the site classified as industrial and note on the deed that hazardous substances, lead and VOCs, remain onsite.

Technical Assessment Summary

According to the data reviewed and the site inspection, the remedy is functioning as intended by the ROD; that is to protect Well 12A. There have been no physical changes of the site that would affect the effectiveness of the implemented remedial actions. There are some operational and optimization issues that have been reported by the RSE report and the EPA O&M contractor. Primarily they include system hardware upgrades, performing a Capture Zone Analysis of the current extraction system, developing recommendations for system improvements, and for improved documentation of capture and control of groundwater contaminants. Some of the recommendations will deal with the suspected DNAPL source and whether it is cost effective to try and remove this source. Removal of DNAPL is difficult and costly but it can reduce the pump and treatment time.

The question of long-term groundwater protectiveness is not confirmed by the groundwater data available. The current GETS system may not fully contain the contaminants and the source. The 1999 review of the data indicates that containment is occurring, but better evaluation tools are available and additional data is needed to make an proper containment analysis. Most of this data generation will be part of the Capture Zone Analysis that is planned for 2004. The existing site remedial actions are considered protective of human health as long as the GETS is operating. There may be some escape of contaminants from site groundwater controls which could effect the downgradient aquifer.

IX. Issues

The major issues concerning this site are presented in Table 2 below:

Table 2

<u>Issues</u>	<u>Affects</u>	
	<u>Protectiveness</u>	
	(Y/N)	
	Current	Future
A Capture Zone Analysis is needed to ensure contaminated groundwater is contained and NAPL is not moving.	N	Y
O&M Costs may be higher than they need to be.	N	Y
O&M needs to be transferred to State	N	Y
Institutional Controls need to be developed and implemented	N	Y

The Remedial Site Evaluation (RSE) report described a number of specific recommendations that could optimize the GETS treatment system. The first recommendation was to conduct a Capture Zone Analysis to determine just how effective the system is at capturing the contaminant plume. This analysis could provide information for improving the capture of contaminants and assuring that all of the contamination is hydraulically controlled, not just in the direction of Well 12A. This could add to the future protectiveness of the remedy.

The GETS system has years of operational data. From review of this data and the evaluation of the existing extracting and treatment equipment, the RSE report recommended replacement of the existing extraction wells with pumps better sized to the amount of water being pumped. The existing pumps were sized for a larger flow than has been achieved. This optimization action could save on future pumping costs.

The actual treatment system consisting of two carbon absorption vessels could be optimized by the addition of an air stripping unit to remove some of the VOCs. The air stripping unit addition is only cost effective if the entire treatment system is totally rebuilt, which is not necessary at this time. The granular activated carbon system would still be necessary to meet the discharge limitations of the treated effluent. This optimization would not change the protectiveness, but would reduce long-term costs.

The CERCLA statute requires that once a fund lead remedial action is operational and functional that the operations and maintenance be transferred to the state. Sites like Well 12A often have long-term remedial actions (LTRA) which are

defined as groundwater remedies involving treatment or other resources to restore groundwater to a level that assures protection of human health and the environment. EPA can operate an LTRA system for up to ten years. Based on the remedial action requirements in the ROD, the original groundwater extraction and treatment system was operational and functional in 1988. The system was significantly upgraded in 1995, but upgrades are included in the original ten year time period. The O&M for this site is scheduled to be transferred to Ecology beginning in 2003. This transfer will not change the protectiveness if the GETS is operated. However, EPA cannot continue funding the O&M at this site which means that Ecology has to plan to operate the system to keep the remedy protective.

The completion of the Capture Zone Analysis should identify specific modifications to the GETS units which will improve efficiency of the system, to verify containment of the contaminated groundwater, and to optimize the O&M of the treatment system. Transfer to Ecology is planned to start in 2003 and be completed by June 2004.

X. Recommendation and Follow-up Actions

The recommendations described in the RSE need to be evaluated after the completion of the Capture Zone Analysis. Most changes are to the mechanical components of the GETS system. Table 3 lists the recommendations of this Five-Year Review and the actions suggested:

Table 3
Recommendations and Actions

<u>Recommendations/ Follow-up Actions</u>	<u>Party Responsible</u>	<u>Oversight Agency</u>	<u>Milestone Date</u>	<u>Follow-up Actions Affects</u>	
				<u>Protectiveness (Y/N)</u>	
				<u>Current</u>	<u>Future</u>
Complete Capture Zone Analysis	EPA	EPA	September 2004	N	Y
Begin Transfer O&M to Ecology	EPA	EPA	December 2003	N	Y
Complete Transfer O&M to Ecology	EPA	EPA	June 2004	N	Y

Implement/Construct Capture Zone Report Recommendations	EPA/Ecology	EPA	2004-2005	N	Y
Develop Institutional Controls	EPA/Ecology	EPA	2004-2005	Y	Y

XI. Statement of Protectiveness:

Based on the Technical Assessment for the Well 12A operable unit (OU1), the remedy is considered protective in the short-term, because there is no evidence that there is a current exposure. The planned Capture Zone Analysis should verify if the existing groundwater extraction and treatment system (GETS) is fully or partially containing the contaminated groundwater plume.

Based on the Technical Assessments for all three operable units (Ous), the protectiveness determination for the South Tacoma Channel site has to be deferred. OU1 and OU3 are considered protective at least for the short-term, but because the Tacoma Landfill, OU2, has some protectiveness issues which are being addressed, EPA defers the site-wide protectiveness decision. The First Five-Year Review for the Tacoma Landfill, OU2, was signed on May 14, 2003. The remedial action at OU2 is not considered protective because of the following issues and actions that need to be taken to determine and ensure protectiveness. All of these actions are scheduled to be implemented by September 30, 2003:

<u>Issue</u>	<u>Action</u>
1. Landfill gas off property	Enhance landfill gas extraction at adjacent property.
2. Water leakage through cap	Monitor flow into cap leak detection system.
3. Odors	Implement the Odor Control Plan.
4. Birds	Evaluate effectiveness of Bird Management Plan.
5. Cans, dumpsters, weeds	Remove visual obstructions from cap.
6. Alternate water connects	Identify and connect any additional residences impacted by landfill.

XII. Next Review

Based on site conditions and the fact that hazardous substances remain on site in each of the three operable units, the next Five-Year Review should occur within five years, or before July 16, 2008.